299-E33-39 (A4864)

Log Data Report

Borehole Information:

Borehole:	299-E33-39 (A4864)		Site:	NW of 216-B-51 French Drain	
Coordinates (WA State Plane)		GWL (ft)[1]:	225.57	GWL Date:	2/11/02
North	East	Drill Date	TOC[2] Elevation	Total Depth (ft)	Type
137,637.4 m	573,843.5 m	Dec. 1990	626.7 ft	230.1	Cable Tool

Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Stainless Steel	2.95	6.625	6.375	0.156	0	surface
Threaded Stainless Steel	1.65	unknown	4	0.055	1.3	229.2

Borehole Notes:

Depth to groundwater level was measured when the Duratek Federal Services' well service crew pulled the pump on 02/11/02. This borehole was not swabbed before logging. On the ground surface, a 4-ft x 4-ft x 6-in. concrete pad surrounds the casing stickup. Zero reference is the top of the 6-in. casing stickup, which is cut squarely. The top of the 4-in. casing is threaded. HWIS[3] is the source of the TOC elevation and location coordinates.

According to Ledgerwood (1993), the well was constructed by drilling a 14-in. nominal hole to 101 ft, a 12-in. nominal hole (the depth of the 12-in. nominal hole is not documented), and a 9.3-in.-diameter hole to 230.1 ft. T304 stainless steel 4-in. casing was used in this borehole, and an estimate of its thickness was obtained from John Auten, drilling engineer with CH2M Hill Hanford, Inc. The MACTEC-ERS logging engineer measured the thickness of the 6-in. casing. This casing appears to only be surface casing as on the as-built (Ledgerwood 1993). The annulus around this casing was sealed with bentonite crumbles and pellets from 20 to 203.1 ft (Ledgerwood 1993). Below the bentonite seal, a silica sand pack surrounds a 4-in. stainless steel screen in the original 9.3-in.-diameter hole (Ledgerwood 1993).

Logging Equipment Information:

Logging System:	Gamma 2B		Type: SGLS (35%)
Calibration Date:	11/01	Calibration Reference:	GJO-2002-287-TAR
		Logging Procedure:	MAC-HGLP 1.6.5, Rev. 0

Spectral Gamma Logging System (SGLS) Log Run Information:

Log Run	1	2			
Date	02/11/02	02/11/02			
Logging Engineer	Spatz	Spatz			
Start Depth (ft)	182.0	230.0			
Finish Depth (ft)	230.5	214.0			
Count Time (sec)	100 s	100 s			
Live/Real	R	R			

Log Run	1	2			
Shield (Y/N)	N	N			
MSA Interval (ft)	0.5	0.5			
ft/min	n/a[4]	n/a			
Pre-Verification	B0081CAB	B0081CAB			
Start File	B0081000	B0081098			
Finish File	B0081097	B0081130			
Post-Verification	B0081CAA	B0081CAA			
Depth Return Error (in.)	n/a	+1.3			
Comments	No fine-gain adjustments.	Repeat section. No fine-gain adjustments.			

Logging Operation Notes:

Pre- and post-survey verification measurements employed the Amersham KUT verifier with serial number 082.

Only the bottom 50 ft of this borehole was logged because grout or bentonite are present in the annular space between the nominal 9- to 14-in. borehole and the casing. Because the casing diameter is too small, a centralizer was not installed on the sonde during logging. Duratek ran MACTEC-ERS's straightness gauge in the 4-in. casing before logging. Zero reference is the top of casing (6-in. casing). Cable slack occurred before reaching the reported depth to bottom (232.2 ft); therefore, the log run was terminated at 230.5 ft.

Analysis Notes:

Analyst:	Sobczyk	Date:	02/27/02	Reference:	MAC-VZCP 1.7.9, Rev. 2

Pre-run and post-run verification spectra were collected at the beginning and end of each day. The recorded peak counts per second (cps) for the 609-keV peak, 1461-keV peak, and 2615-keV peak were about 8 percent lower in the post-run verification as compared to the pre-run verification. All of the verification spectra were within the control limits. The post-run verification spectra were used to determine the energy and resolution calibration for processing the data using APTEC Supervisor.

Log spectra were processed in batch mode using APTEC Supervisor to identify individual energy peaks and determine count rates. Concentrations were calculated in EXCEL (source file: G2BCALC4.xls), using calibration coefficients from November 2001. Zero reference is the top of the casing. The casing configuration was assumed to be one string of 4-in. casing with a thickness of 0.055 in. for the logged interval. A water correction was applied at 225.6 ft. Dead time corrections were not needed because dead time did not exceed 10.5 percent.

Log Plot Notes:

Separate log plots are provided for gross gamma and dead time, naturally occurring radionuclides (^{40}K, ^{238}U, and ^{232}Th), and man-made radionuclides. For each radionuclide, the energy value of the spectral peak used for quantification is indicated. In addition, plots of gross gamma and man-made radionuclide data collected by Westinghouse Hanford Company's (WHC's) Radionuclide Logging System (RLS) show the gamma flux prior to this borehole's completion as a groundwater monitoring well. Unless otherwise noted, all radionuclides are plotted in picocuries per gram (pCi/g). The open circles indicate the minimum detectable level (MDL) for each radionuclide. Error bars on each plot represent error associated with counting statistics only and do not include errors associated with the inverse efficiency function, dead time correction, or casing correction. A combination plot is also included to facilitate correlation. The plot of the repeat log demonstrates good repeatability of the SGLS data for the naturally occurring radionuclides.

Results and Interpretations:

Man-made radionuclides were not detected in the logged portion of this borehole. In 1991, WHC detected ^{137}Cs from 0 to 7 ft. The maximum activity reported was 2 pCi/g at 1 ft.

Recognizable changes occur in the KUT and total gamma logs. The decreases in the KUT logs at 206.5 ft are attributed to the end of the bentonite seal that was installed in 1991 and entry into a zone where the annular space is filled with a silica sand pack. It is likely that the undisturbed sediments are only being marginally detected by the SGLS. The 10-cps decreases in total gamma at log depths 192, 212, and 222 ft are attributed to casing joints. Above 206.5 ft, the KUT response is primarily due to the bentonite seal. The WHC total gamma data show an increase in total gamma activity in the interval from 155 to 170 ft, which is correlatable with a similar increase in total gamma in 299-E33-11, which is located about 190 ft to the east. In 299-E33-11, this elevated total gamma is the result of relatively high ^{232}Th activities.

Due to the method of well completion, it is uncertain if the activities measured by the SGLS in this borehole reflect the uniform distributions of the natural and man-made radionuclides in the formation. The formation below 206 ft has not been adequately characterized in this well by either the SGLS or RLS, even though the borehole was logged with the RLS in 1998, prior to its completion as a RCRA groundwater monitoring well. The faster log speed (0.4 ft/min) resulted in significantly shorter counting times such that the distribution of radionuclides in the formation surrounding this borehole is not known as well as in the surrounding boreholes, which have been logged with the SGLS. Although the SGLS failed to detect man-made contaminants in this well, the presence of a relatively wide annulus filled with bentonite and/or sandpack around the casing greatly attenuates gamma rays originating in the surrounding formation. Results from this borehole may not reflect actual concentrations in the formation and should be used with caution. It is recommended that other RCRA wells with similar configuration (large annular space filled with grout and/or bentonite, sandpack) should be evaluated for suitability for logging on a case-by-case basis.

References:

Ledgerwood, R.K., 1993. *Summaries of Well Construction Data and Field Observations for Existing 200-East Resource Protection Wells*, WHC-SD-ER-TI-007, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

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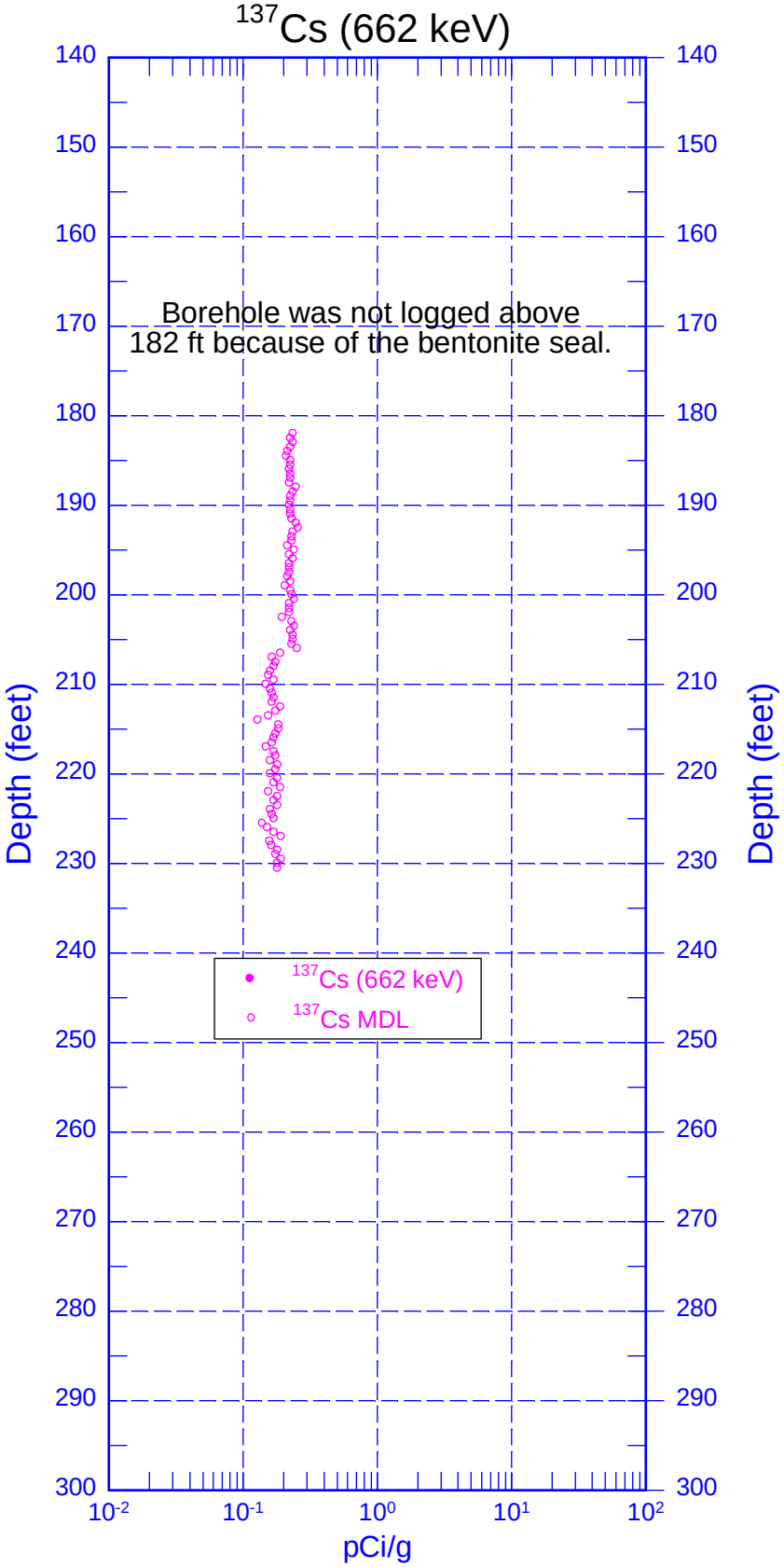
[1] GWL - groundwater level
[2] TOC - top of casing
[3] HWIS - Hanford Well Information System
[4] n/a - not applicable

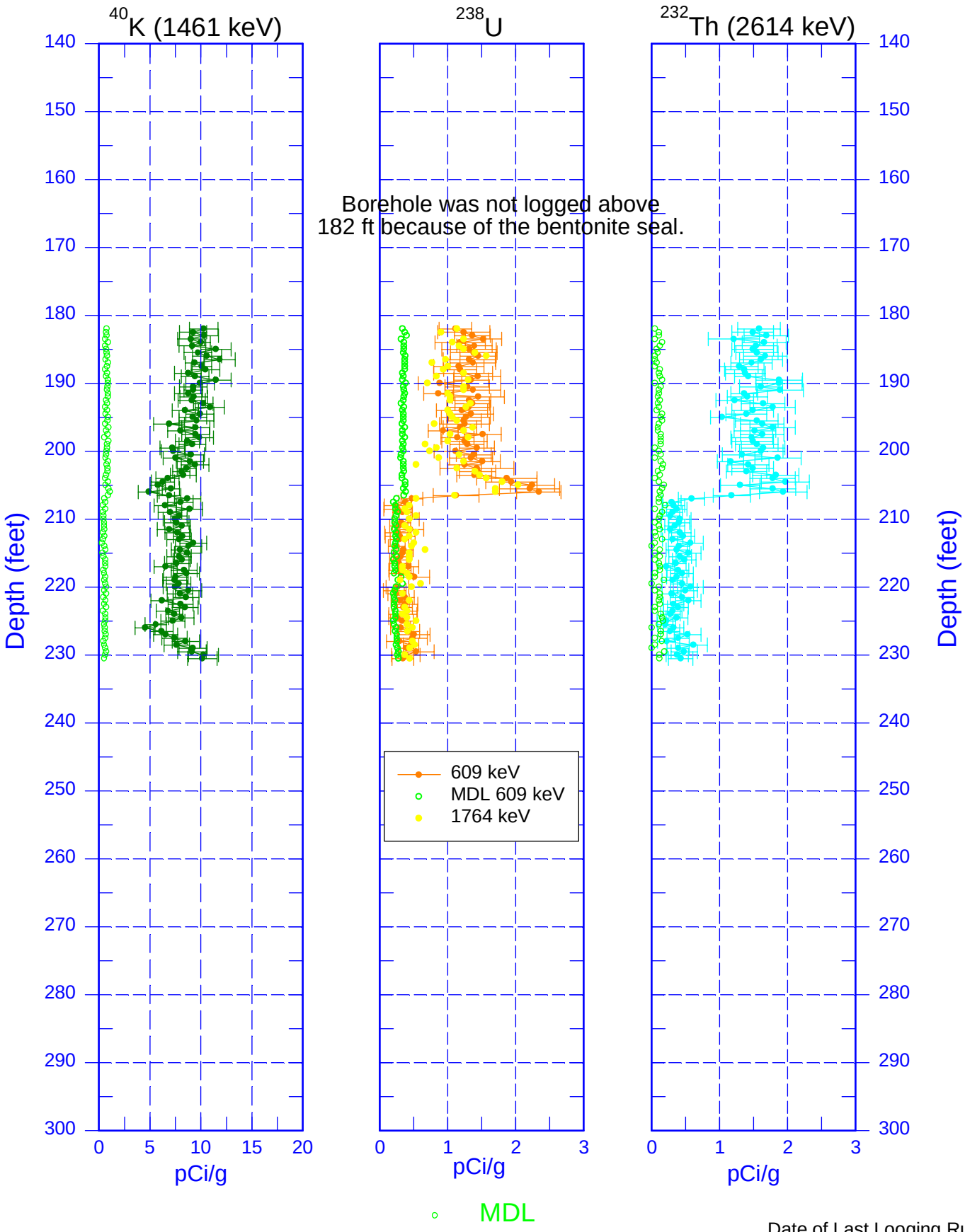
299-E33-39 (A4864)
Man-Made Radionuclides



Zero Reference = Top of Casing

Date of Last Logging Run
02/11/2002

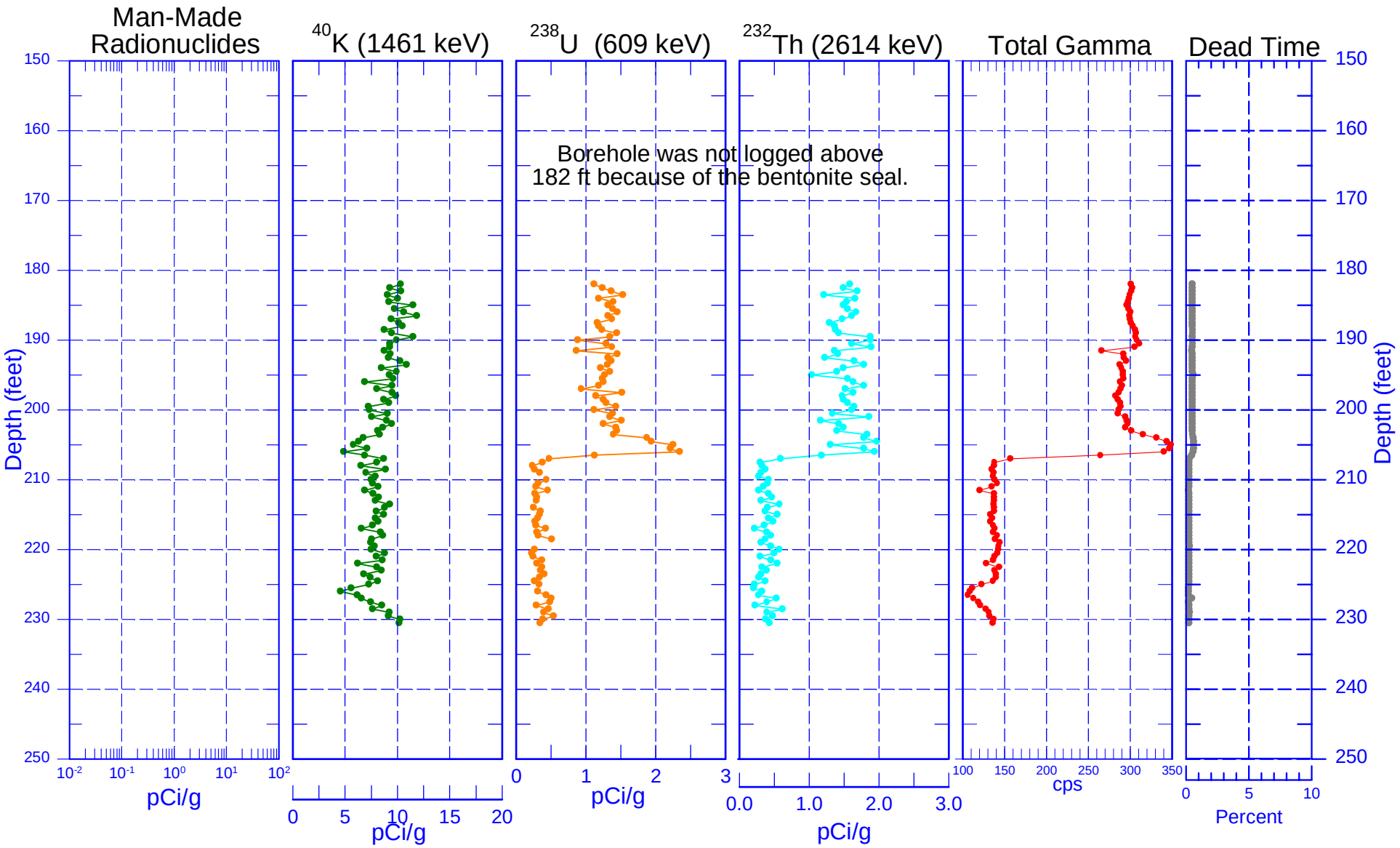
299-E33-39 (A4864)
Natural Gamma Logs



Zero Reference = Top of Casing

Date of Last Looging Run
02/11/2002

299-E33-39 (A4864) Combination Plot

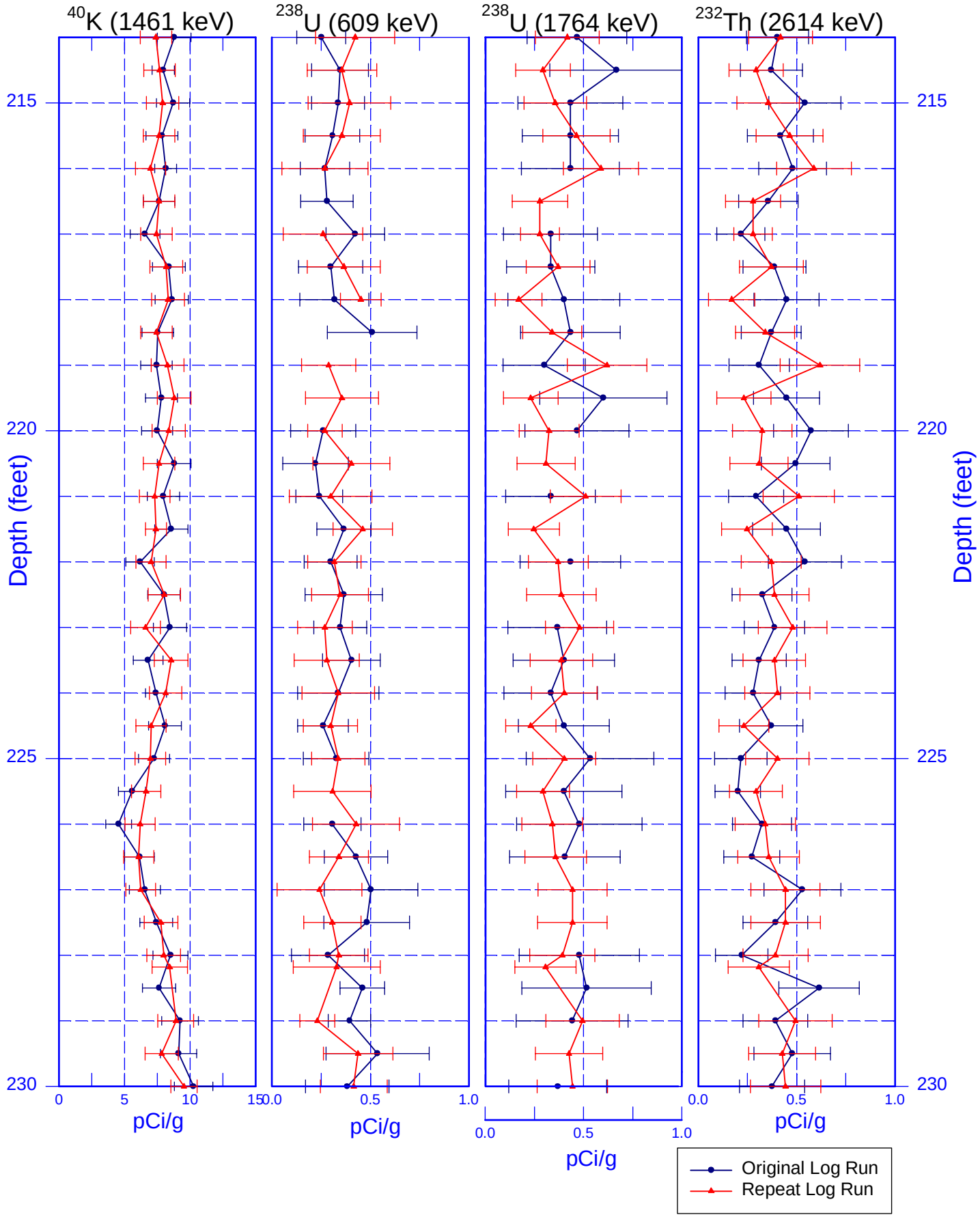


Zero Reference = Top of Casing

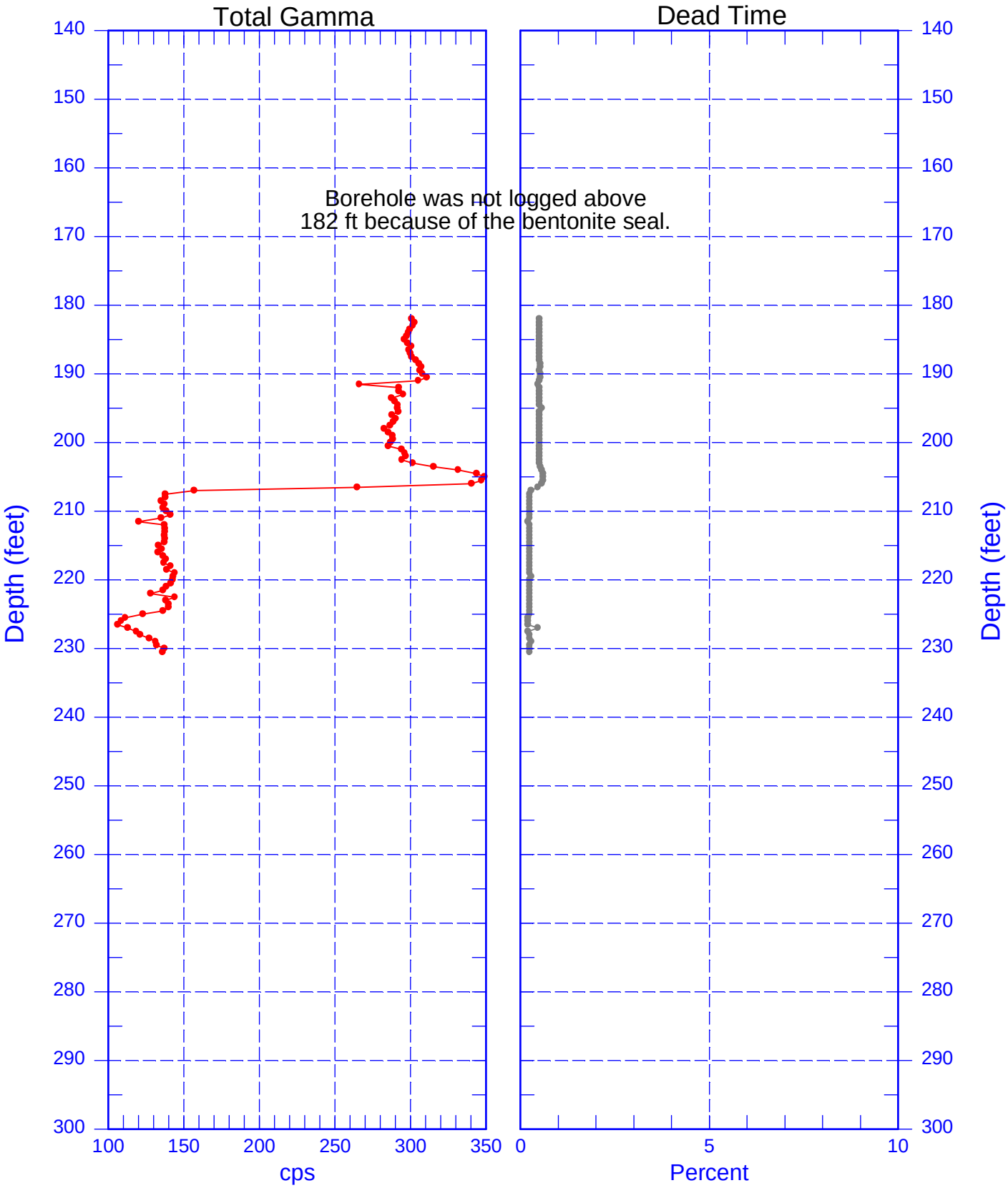
Date of Last Logging Run
02/11/2002

299-E33-39 (A4864)

Rerun of Natural Gamma Logs



299-E33-39 (A4864)
Total Gamma & Dead Time

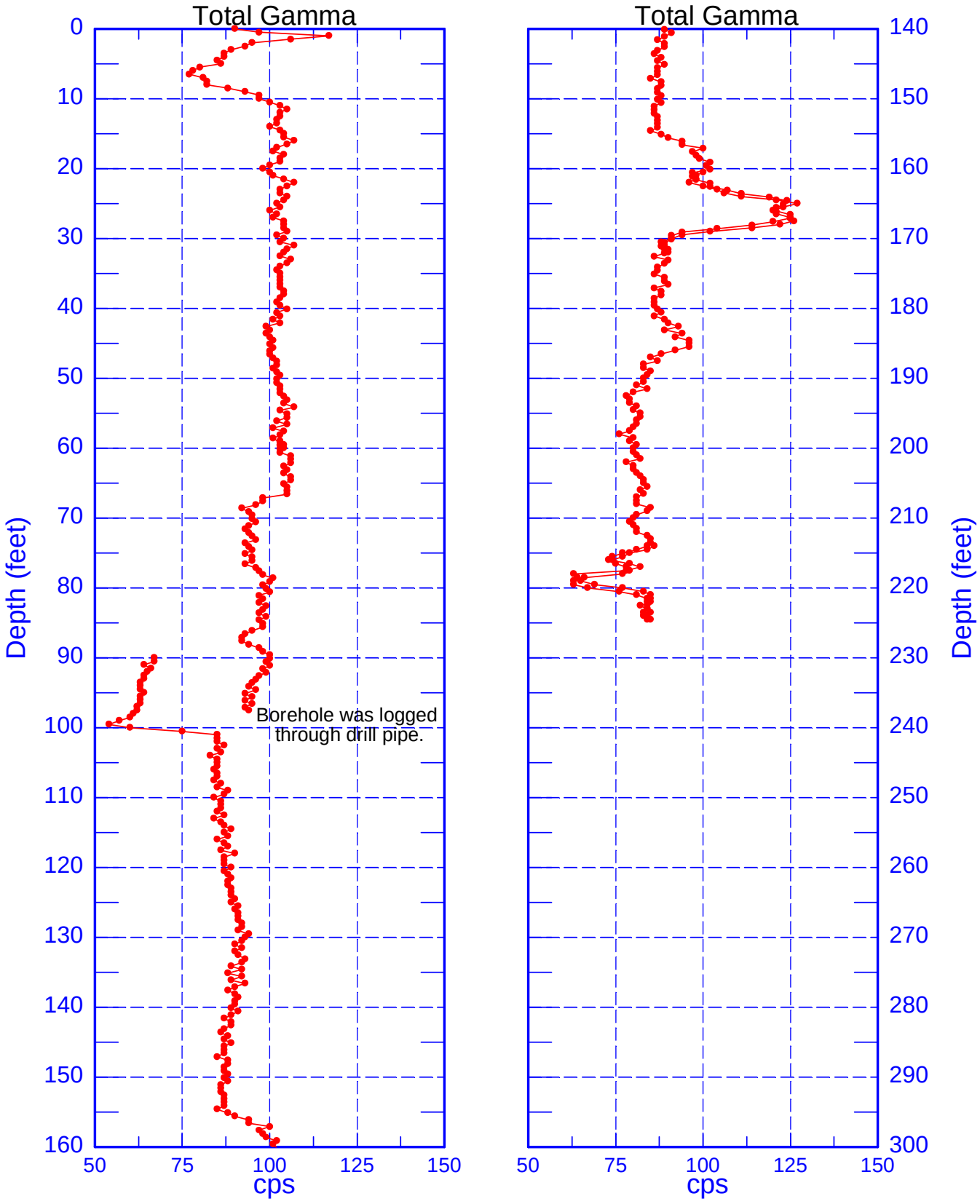


Zero Reference = Top of Casing

Date of Last Logging Run
02/11/2002

299-E33-39 (A4864)

Logged & Processed by WHC January 22, 1991



Zero Reference = Ground Level